

**Changes Over Time ▪ Skills Lab****Telltale Molecules****Problem**

What information can protein structure reveal about evolutionary relationships among organisms?

**Skills Focus**

interpreting data, drawing conclusions

**Procedure**

- Examine the table below. It shows the sequence of amino acids in one region of a protein, cytochrome c, for six different animals.
- Predict which of the five other animals is most closely related to the horse. Which animal do you think is most distantly related?

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- Compare the amino acid sequence of the horse to that of the donkey. How many amino acids differ between the two species? Record that number in your notebook.
- Compare the amino acid sequences of each of the other animals to that of the horse. Record the number of differences in your notebook.

Section of Cytochrome c Protein in Animals															
Animal	Amino Acid Position														
	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Horse	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Donkey	A	B	C	D	E	F	G	H	Z	J	K	L	M	N	O
Rabbit	A	B	C	D	E	Y	G	H	Z	J	K	L	M	N	O
Snake	A	B	C	D	E	Y	G	H	Z	J	K	W	M	N	O
Turtle	A	B	C	D	E	V	G	H	Z	J	K	U	M	N	O
Whale	A	B	C	D	E	Y	G	H	Z	J	K	L	M	N	O

**Changes Over Time** ▪ *Skills Lab*

**Telltale Molecules** *(continued)*

**Analyze and Conclude**

*Write your answers in the spaces provided.*

- 1. Interpreting Data** Which animal's amino acid sequence was most similar to that of the horse? What similarities and difference(s) did you observe?

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- 2. Drawing Conclusions** Based on these data, which species is most closely related to the horse? Which is most distantly related?

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- 3. Interpreting Data** For the entire protein, the horse's amino acid sequence differs from the other animals' as follows: donkey, 1 difference; rabbit, 6; snake, 22; turtle, 11; and whale, 5. How do the relationships indicated by the entire protein compare with those for the region you examined?

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- 4. Communicating** Write a paragraph explaining why data about amino acid sequences can provide information about evolutionary relationships among organisms.

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**More to Explore**

Use the amino acid data to construct a branching tree that includes horses, donkeys, and snakes. The tree should show one way that the three species could have evolved from a common ancestor.